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A current exploratory research project is directed toward developing means for gathering systematic data on nonverbal representation in young children. Tasks involving nonverbal representational functioning have been developed, evaluated in preliminary work with fifteen 4-year-old subjects, and revised. The revised series of tasks consists of four groups, designated as (1) play situations, (2) imitations, (3) spatial arrangements, and (4) picture-object matching. This revised instrument will be employed in a study of which the objectives are (1) the investigation of aspects of nonverbal representation in disadvantaged, as compared with middle class, preschool children, (2) the investigation of relationships between nonverbal symbolizing ability and linguistic competence, and (3) the development of a more refined series of evaluative tasks. In addition to the experimental instrument, three tests of language usage will be administered, and additional data will be accumulated concerning subject's test performance, background, and classroom behavior. For the comparative testing, 30 disadvantaged and 30 advantaged 4- and 5-year-olds will be matched for age and sex. Attachments to this report include the list of tasks and the inventory form for recording factors affecting test performance. (JS)

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HEAD START EVALUATION AND RESEARCH CENTER

Progress Report of Research Studies
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Document 3

AN EXPERIMENTAL APPROACH TO STUDYING NON-VERBAL REPRESENTATION IN YOUNG CHILDREN

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AN EXPERIMENTAL APPROACH TO STUDYING NON-VERBAL REPRESENTATION IN YOUNG CHILDREN

This summary constitutes an interim report on research in progress. The report is comprised of three parts: (I) statement of the problem, (2) initial phases of inquiry, (3) outline of study underway.

Statement of the Problem

An accumulating body of observation suggests that the disadvantaged child shows deficiencies in aspects of linguistic functioning. A considerable amount of research has been directed towards the delineation of phenomena, the identification of controlling variables, and the development of remedial techniques and programs. One question that has received relatively little attention in this context is that of the relation between verbal and non-verbal means of representing or symbolizing experience (see, however, Sigel, Anderson and Shapiro, 1965; Sigel and McBane, 1967). If one takes the view that non-verbal representation constitues an essential phase of aspect of total cognitive development (Piaget, 1962; Bruner, Oliver and Greenfield, 1966; Werner, 1948; and if, moreover, one contends that much language usage rests on a capacity for symbolic formulation which is more fundamental than speech itself (Werner and Kaplan, 1963), than one is led to ask whether some of the cognitive and linguistic difficulties of disadvantaged children may not be due to general difficulties in symbolic representation (not restricted to the sphere of language). Evidence indicating that (a) disadvantaged youngsters manifest more difficulties in non-verbal symbolization than do middle class children, and (b) there is a positive relationship between ability in non-verbal representation and conceptual language usage, would have theoretical implications regarding the possible basis of linguistic deficit and practical implications in the sphere of pre-school programs for the disadvantaged.

Initial Phases of Inquiry

The current research, which must be viewed as exploratory in nature, is directed towards developing means for gathering systematic data on non-verbal representation in young children. We have tried to develop tasks which can be assumed to involve non-verbal representational functional and that are not remote, in materials or required operations, from the everyday activities of pre-school children. At the same time, we have tried to develop groups of tasks that differ in the mode of representation (e.g. bodily gesture, pictorial representation) required. While it is not assumed that performance on such tasks is "language independent", the tasks do not require any verbalization on the part of the child and there seems adequate basis for supposing that the do not require explicitly linguistic operations. Tasks developed included those centering around: (a) the use of realistic and non-realistic materials in play situations, (b) the imitation of body gestures and object motions, (c) the matching of pictures with objects. Careful consideration of the tasks, and preliminary work with 15 subjects of approximately 4 years of age (selected from disadvantaged and middle class populations), made apparent the following problems: (I) Some tasks and materials were not age appropriate; (2) the range of tasks was not sufficiently broad for our purposes; (3) situations and objects that children were required to "represent" were not equally familiar to children in the two groups (disadvantaged and middle class); (4) degree of experimenter participation was not sufficiently standarized; (5) differences in performance seemed, in some cases, to be a function of differential understanding of verbally given instructions.

During the past months, these problems have been dealt with through extensive revisions of tasks and procedures. Such revisions include: (a) total revision of many tasks (e.g. development of entirely new set of materials and procedures for object-m ing tasks); (b) development of a new series of tasks involving the representation of spatial arrangements; (c) elimination

PS001074

of contents which could be considered less familiar to deprived children, and the substitution of contents which can be considered at least grossly equal in familiarty to children of the two groups; (d) standardization of administration of all task situations; (e) the introduction of demonstration items to further minimize the role of verbal instructions.

Our concern with (a) the general problem of test validity (i.e. the relationship between task performance and non-verbal representational functioning in non-test situations) and (b) the relationship between non-verbal representational functioning and language usage, has led us to include -- in the current study -- data on classroom play activities, and performance on tests of linguistic ability.

Current Study

A. Objectives and Hypotheses

The current exploratory study has three main objectives. The first is to investigate, through performance on a series of tasks, aspects of non-verbal representation in disadvantaged as compared with middle class pre-school children. The second objective is to investigate, in a preliminary way, relationships between non-verbal symbolizing ability and linguistic competence. The third objective is to develop, on the basis of continuing investigations, a set of tasks or techniques tapping non-verbal representational functioning which is more refined and systematic than is the set of tasks being used in this exploratory investigation.

Our general hypotheses may be stated in the form of questions:

1. Are there differences between disadvantaged and middle class pre-schoolers in performance on the series of non-verbal representation tasks?

2. Is there generality to the measures of non-verbal representation to be employed? (Such generality would show up in a (a) individual consistency in task performance, (b) consonance between task performance and relevant classroom behavior).

3. Is there a positive relationship between non-verbal representation 1 functioning and linguistic ability, such that those subjects who perform best on the tasks will also be the ones who score highest on indicators of language competence?

B. Data and Instrumentation

The tasks. The revised series of tasks is comprised of four groups, designated as (a) play situations, (b) imitations, (3) spatial arrangements, (d) picture-object matching. The complete list of tasks, including demonstration items and instructions, is appended (Attachment A). It can be seen that each task is presented at two levels of difficulty -- an ("easy and a "hard form) (the latter presumably involving a greater gap than the former between what is to be represented and the means available).

Language usage. Three tests of language usage will be employed. These are: (a) the Vocal Encoding sub-test of the Illinois Test of Psycholinquistic Abilities (which requires the subject to describe each of four objects presented to him), (b) the Picture Vocabulary of the Stanford Binet Intelligence Scale, and (c) the Vocabulary sub-test of the WPPSI. In addition, tape recordings, will be made of all testing sessions.

Additional data. After each testing session, the between sessions & behavior rated on "Inventory of Factors Affecting Test Performance" (Attachment B) Observations of classroom behavior, focussing on language usage and play activities, will be undertaken on at least a portion of the subjects. Efforts will be made to obtain data pertaining to (a) length and nature of school experience, (b) family background.

C. Subjects

Subjects for the disadvantaged group will be drawn from two or three Headstart classrooms, and from the Early Childhood Center. Subjects for the middle class group will be drawn from private nursery schools (Bank Street School for Children, Sarah Lawrence Nursery School). In terms of family

background, variety of experience, etc., these children constitute an advantaged group. For this exploratory study, it seems appropriate to use children who might be considered at the other extreme from the deprived.

All subjects will be between four and five years of age, and an equal number of boys and girls will be included in each group. There will be 30 subjects in each group. In view of the exploratory nature of the investigation, it does not seem warranted to attempt matching of subjects other than in terms of age. We hope to procure, as at least part of our sample, children on whom considerable data is available from other studies (Bank Street Headstart Evaluation data, V. Stern's proposed study of play).

D. Analysis of Data

Methods for coding of task performance are currently being worked out. Performance of the two groups (disadvantaged and middle class) on each group of tasks, and on the set of tasks as a whole, will be compared through qualitative and quantiative analysis.

Data from tape recordings of test sessions, language tests, and task performance will be utilized to investigate relationships between language usage and non-verbal representational functioning.

An examination of individual consistency in task performance, and comparison of classroom behavior with test performance, will be undertaken in the attempt to ascertain the generality of our measures of non-verbal representational functioning.

Data from "Inventory of Factors Affecting Test Performance" will be utilized to check on whether differences between groups on task performance are closely related to variables such as attention span, etc.

As far as current activities are concerned, we are currently engaged in pre-testing items from the present set of tasks, in developing scoring procedures on the basis of pre-test data, and in establishing an order for the presentation of tasks.

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Attachment A

TASKS FOR STUDY OF NON-VERBAL REPRESENTATION*

I. PLAY SITUATIONS

In these two tasks, the child is given sets of materials and directions concerning the setting. Each play situation is presented in two forms: (a) with realistic play materials, (b) with non-realistic play materials. The presentation of the two situations ("kitchen" and "street scene") is preceded by a demonstration item.

Demonstration for Play Situation Tasks

Materials:

Four flat tabletop blocks and a family of four Flagg dolls. (Light-skinned dolls are used for light-skinned children, dark-skinned dolls for dark-skinned children.)

Administration:

The blocks are placed flat on the table in front of the child and the dolls are placed standing up, close by. E says: "Could you pretend, make believe, that these people are going to bed, lying down in their beds?" If no response, or in case of play not following instructions, say something like, "This lady is going to bed" and put her on one of the blocks; then ask child, "Can you put this little girl on her bed?" and so on, until all four people are in bed. (Since the purpose of the demonstration item is to make clear to the child the nature of the task, E may participate as much as necessary, but should not allow the subject to be merely an observer.)

Play Task #1 ("Kitchen")

Materials:

a. Realistic: toy coffee pot, cup and saucer, pot, dish, spoon and fork
b. Non-realistic: hollow wooden cylinder, smaller and larger wooden cup-like forms, 2 wooden discs, 2 sticks. (Note: These materials are the same size as the realistic materials.)

Administration:

Realistic or non-realistic sets of materials are placed on table in front of child, and the following instructions given: "Could you pretend, make believe, that you are in the kitchen and making something to eat?" (If no response, repeat question.)

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* Each task is presented to the subject in two forms. For PLAY SITUATIONS, SPATIAL ARRANGEMENTS AND PICTURE-OBJECT MATCHING, some of the materials for the two forms of each task differ; for IMITATIONS, the conditions differ (i.e. simultaneous vs. delayed imitation). The two forms of each task are presumed to differ in difficulty; the "easier" version of each task is stated first in this listing. The order of presentation of tasks to subjects has not been finally determined.

Play Task #2 ("Street Scene")

Materials:
a. Realistic: miniature houses, miniature fire engine, truck, 2 cars
b. Non-realistic: tabletop unit blocks, 4 small pieces of wood. (Note: these materials correspond in approximate shape and size to the realistic materials.)

Administration:
For realistic materials, miniature houses are arranged in two rows (simulating a street); miniature trucks and cars are placed to one side, but close by. For non-realistic materials, tabletop unit blocks are arranged as the houses were in the realistic condition; small pieces of wood are placed as were the trucks and cars. For both sets of materials, the instructions are: "This is a street. Could you pretend, make believe, that there is a fire in one of the houses?" (Repeat if necessary.)

II. IMITATIONS

In these four tasks, the child is asked to imitate body (arm) movements and object motions. Each task is presented for simultaneous and delayed imitation. Presentation of body movement tasks and object motion tasks is preceded by a demonstration item.

Demonstration for Body Movement Tasks

E says, "Now, watch what I'm doing, and then you do it." E, standing up, brings hands together and claps twice. E asks child to imitate this gesture, offering encouragement and repeating gesture if necessary.

Body Movement #1 (Clapping)

E, standing up, swings arms at sides, brings arms up over head, and claps hands twice.
a. Instructions for simultaneous imitation: "Watch what I'm doing, and then we'll do it together."
b. Instructions for delayed imitation: "Watch what I'm doing, and then -- when I've stopped -- you try it."

Body Movement #2 (Arm Position)

E, standing up, stretches one arm up, the other down; E then reverses arm positions; finally brings other arm up, ending with both arms stretched upwards. Instructions are as before.

Demonstration for Object Motion Tasks

E says, "Watch what I'm doing and then show me, with your hand, what the hammer is doing, how the hammer is moving." E pounds table with toy hammer. If child does not respond, E repeats demonstration, encouraging child to try; if necessary, E shows him how one might imitate hammer movement. (Child should not actually use hammer.)

Object Motion #1 (Scissors)

E opens and shuts pair of scissors, and, pointing them to the left, moves them in a cutting motion from right to left.

a. Instructions for simultaneous imitation: "Look at the scissors, and show me with your hand what they are doing, how they are moving."
b. Instructions for delayed imitation: "Look at this, just watch it, and when I stop, show me what the scissors were doing, and how they were moving.

Object Motion #2 (Cylinder Rolling)

E rolls cylinder across table. Instructions for simultaneous and delayed imitation correspond to those for "scissors motion."

III. SPATIAL ARRANGEMENTS

In these three tasks, the experimenter places a set of materials in a given arrangement, and the child is asked to make the same arrangement with similar but not identical materials. The child is asked to make each arrangement with (a) materials relatively similar to those used by E and (b) materials less similar to those used by E. The presentation of the series of tasks is preceded by a demonstration item.

Demonstration for Spatial Arrangement Tasks

Materials:
For model: Small red ball, plastic cup
For subject: Small cube of wood, square wooden container.

Administration:
E places box containing cube and container in front of child. Saying "Watch what I'm doing and then do it with your things," E proceeds to put the small red ball into the plastic cup. E provides whatever help is necessary (repeating instructions, encouraging, repeating demonstration, etc.).

Spatial Arrangement #1 (Putting two smaller objects on larger object)

Materials:
For model: 2 identical yellow blocks, larger red block
a. Similar: 2 identical blue cubes, larger green block
b. Dissimilar: 2 odd-shaped wooden pieces, larger wooden disc.

Administration:
E places box containing materials (a. or b.) in front of child. Saying "Watch what I'm doing, and then do it with your things," E proceeds to place the two yellow blocks side by side on the red block.

Spatial Arrangement #2 (Enclosure)

Materials:
For model: 4 tabletop "butter blocks," red disc
a. Similar: 4 tabletop unit blocks, blue cube
b. Dissimilar: 4 triangular blocks of different colors, yellow cylinder

Administration:
E arranges the four blocks in a hollow square and puts the red disc inside the aquare. E then asks the child to do the same with his materials.

Spatial Arrangement #3 (Placing objects in a row according to size)

Materials:
For model: 3 yellow cylinders of different heights
a. Similar: 3 triangular solids of different sizes
b. Dissimilar; 3 uncolored wooden forms, differing in size and shape

Administration:
As before. E arranges the yellow cyclinders in a row from smallest to largest.

IV. PICTURE-OBJECT MATCHING

In this series of four tasks, the child is presented with an array of four objects and a photograph of one of the objects. For each array of objects there are two photographs. One shows the object in focus; the other is both out of focus and depicts the same object from a slightly different perspective. The child is given either the clear photograph or the unfocused one (at different times) and is asked to indicate which object is shown on the photograph.

Demonstration for Picture-Object Matching

Materials:
a. Objects in array: string of beads $_1$, string of beads $_2$, pendant necklace, chain
b. Photograph of beads$_1$, in focus

Administration:
E places the four objects in front of the child and, showing him the photograph, says, "This is a picture of one of these things. Show me which object it is a picture of." E provides as much encouragement and help as necessary, indicating correct matching if need be.

Picture-Object Match #1 (Horse)

Materials:
a. Objects in array: toy horse$_1$, toy horse$_2$, toy cow, toy dog
b. Photograph of toy horse$_1$, in focus or
c. Photograph of toy horse$_1$, out of focus and from a different perspective

Administration:
E presents objects and one of the two photographs and says, "This is a picture of one of these things. Show me which one it is a picture of." After matching has been made or attempted, E asks child to name objects and photograph.

Picture-Object Match #2 (Car)

Materials:
a. Objects in array: toy car$_1$, toy car $_2$, toy station wagon, toy truck
b. Photograph of toy car$_1$, in focus or
c. Photograph of toy car$_1$, out of focus and from a different perspective

Administration: As before

Picture-Object Match #3 (Hairbrush)

Materials:
a. Objects in array: hairbrush,$_1$ hairbrush,$_2$ toothbrush, cleaning brush
b. Photograph of hairbrush,$_1$ in focus or
c. Photograph of hairbrush,$_1$ out of focus and from a different perspective

Administration: As before

Picture-Object Match #4 (Container)

Materials:
a. Objects in array: plastic container,$_1$ plastic container,$_2$ glass jar, partially filled container
b. Photograph of plastic container,$_1$ in focus or
c. Photograph of plastic container,$_1$ out of focus and from a different perspective

Administration: As before

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Attachment B

INVENTORY OF FACTORS AFFECTING TEST PERFORMANCE*

Child's Name _____ Center No. _____ Time Finished _____
Child's No. _____ Class No. _____ Time Started _____
Total Time _____

This inventory focuses on the need to identify factors which adversely affect test performance on the Stanford-Binet. It should be completed by the tester immediately following each administration of the Binet.

A set of factors which may adversely affect the child's test performance are listed below, with several styles in which the factor may express itself. A rating scale is provided to indicate the degree of adverse effect noted by the tester.

If a factor does NOT adversely affect performance, circle the ZERO on each scale. If performance is adversely affected, note the degree to which the factor is detrimental to test performance and circle the number corresponding to the degree of adverse effect according to the scale below. Finally, indicate by circling the appropriate letter at the right the style in which the adverse effect is expressed during testing.

Factor	Degree of Adverse Effect of Factor						Style
X	0	1	2	3	4	5	A
	No Adverse Effect	Mildly Detrimental		Moderately Detrimental		Seriously Detrimental	B C

Factor	Degree of Adverse Effect of Factor	Style
Response to test		
1. Gives the test the attention it requires	0 1 2 3 4 5	A. easily distracted B. overly absorbed in one or more tasks so that transitions are difficult C. vaguely inattentive and uninvolved
2. Realistic sense of competence	0 1 2 3 4 5	A. distrusts or anxious about own abilities B. overly confident of own abilities C. lacking in concern with competence
3. Adequate response time	0 1 2 3 4 5	A. impulsive -- responds without adequate delay B. slow to respond -- much urging needed

*Adapted from Stanford-Binet and UCLA scales

Factor	Degree of Adverse Effect of Factor	Style
Response to test		
4. Is matter of fact about tasks or enjoys them	0 1 2 3 4 5	A. dislikes tasks, antagonistic B. fearful, guarded C. apathetic -- lacking pleasure or displeasure
5. Adequately persistent in the face of difficulty	0 1 2 3 4 5	A. gives up easily B. can't give up C. behavior unmodified in the face of difficulty
6. Reacts to failure realistically	0 1 2 3 4 5	A. withdraws B. becomes hostile C. denies, seems indifferent to failure
Response to examiner		
7. Feels socially at ease	0 1 2 3 4 5	A. belligerent, rebellious B. shy, reticent, reserved C. unresponsive-apathetic
8. Responds to normal amount of encouragement and support	0 1 2 3 4 5	A. needs constant praise and encouragement B. acts overly independent C. indifferent to praise or encouragement
Generalized responses		
9. Normal activity level	0 1 2 3 4 5	A. hyperactive B. hypoactive
10. Normal verbal productivity	0 1 2 3 4 5	A. verbose B. taciturn
11. (for bilingual or multilingual children) English usage adequate	0 1 2 3 4 5	A. English usage inadequate
Test conditions		
12. Adequate	0 1 2 3 4 5	Specify nature of inadequacy or interference, e.g., room noisy, child sick, etc. _____ _____